

REMARKS

Claims 1-21 are all the claims pending in the application. Applicants thank the Examiner for indicating that claims 5-7, 20 and 21 are allowed and that claims 3 and 10-14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten into independent form.

Drawings

The Examiner has not acknowledged receipt or indicated approval of the drawings. Applicants respectfully request such acknowledgement in the next Office action.

IDS

A Form PTO-1449 was submitted on July 10, 2001 which listed the ISR references, as well as complete copies of each reference. The Notice of Acceptance of Application received from the USPTO acknowledges receipt of the Information Disclosure Statement; however, the Examiner has not returned the initialed Form PTO-1449. Applicants respectfully request the return of an initialed PTO-1449 with the next Office action.

Claims

Claim 17 is rejected under 35 U.S.C. § 112, second paragraph. Applicants amend the claims to remove any ambiguities.

Claim 1 is rejected under 35 U.S.C. § 102(b) as being anticipated by Kokon (JP 62-21888).

Claims 1, 2 and 8 are rejected under 35 U.S.C. § 102(b) as being anticipated by Torm (JP 62-57994).

Claim 9 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Kokon (JP 62-21888).

Claims 4, 9 and 15 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Torm (JP 62-57994).

Claim 16 is rejected under 35 U.S.C. § 103(a) as being unpatentable over either one of Kokon (JP 62-21888) or Torm (JP 62-57994) as applied to claim 9, and further in view of Kuromizu (EP 0342492) and Sumitomo (JP 07238480).

Claim 18 is rejected under 35 U.S.C. § 103(a) as being unpatentable over either one of Kokon (JP 62-21888) or Torm (JP 62-57994) as applied to claim 9, and further in view of Watanabe (JP 08170283).

Claim 19 is rejected under 35 U.S.C. § 103(a) as being unpatentable over either one of Kokon (JP 62-21888) or Torm (JP 62-57994) as applied to claim 9, and further in view of Abe (4,762,466).

Analysis

The present invention relates to a steel cord which achieves high durability by preventing the precedent breakage in the filaments of the strand construction, in order to suppress the lowering of the cord tenacity. The present invention is also directed to a tire which utilizes such a cord, to achieve good durability (See Specification, page 3, lines 4-8).

Premature breakage of the filament is particularly problematic in the outermost sheaths of the core strand and the sheath strand (See Specification, page 2, lines 29-31).

To overcome this problem, the present invention adopts a construction in which all of the filaments constituting an outermost sheath layer have the same diameter, which is larger than the diameter of the filaments constituting at least a layer located inside the outermost sheath layer.

Of the rejected claims, only claims 1, 2 and 9 are in independent form; therefore, the following discussion is initially directed to these independent claims.

Turning to the cited prior art, both of the steel cords disclosed in Kokon (JP62-21888) and Torm (JP62-57994) are the Warrington type, while a steel cord of the claimed invention is not of the Warrington type because all of the filaments constituting the outermost sheath layer in each of the core strand and the sheath strand have the same diameter.

A Warrington-type steel cord has the outermost sheath layer constituted by both filaments having a small diameter and filaments having a large diameter. With this construction of Warrington-type steel cords, the stress concentrates at the filaments having a small diameter among the filaments constituting the outermost sheath layer, and hence the breakage of the filament is more prematurely caused in the outermost sheath layer.

Still further, Kokon (JP62-21888) and Torm (JP62-57994) do not identify the problems associated with this type of cord, wherein the premature breakage of the filament is particularly problematic in the outermost sheaths of the core strand and the sheath strand.

Regarding claim 1, all of the filaments constituting the outermost sheath layer have the same diameter, which is larger than the diameter of the filaments constituting the inner layers.

On the contrary, Kokon (JP62-21888) discloses that in the sheath strand A₂, a diameter d₂ of the filament constituting the core 4 is 0.53 mm, a diameter d₃ of each of the filaments 5

constituting the first sheath is 0.50 mm and diameters of the filaments 6 constituting the second sheath are 0.53 mm and 0.40 mm. Thus, the breakage of the filament 6 having a smallest diameter (0.40 mm) is prematurely caused in the outermost (second) sheath layer.

Moreover, Torm (JP62-57994) discloses that in the sheath strand B, a diameter of the filament constituting the core 5 is 0.37 mm, a diameter of each of the filaments 6 constituting the first sheath is 0.35 mm and diameters of the filaments 7a, 7b constituting the second sheath are 0.290 mm and 0.380 mm. Thus the breakage of the filament 7a having the smallest diameter (0.290mm) is prematurely caused in the outermost (second) sheath layer.

In view of the foregoing, the cited prior art fails to teach or suggest the present invention according to claim 1. Therefore, claim 1 is patentable.

Regarding claim 2, a core constituting the core strand is made of three filaments and all of the filaments constituting each sheath layer have the same diameter.

On the contrary, Kokon (JP62-21888) discloses that in the core strand A₁, the core is made of four filaments and all of the filaments constituting the outermost sheath layer do not have the same diameter because of the Warrington type steel cord, as discussed above.

Additionally, Torm (JP62-57994) discloses that in the core strand A, the core is made of four filaments and all of the filaments constituting the outermost sheath layer do not have the same diameter because of the Warrington type steel cord construction. In addition, while FIGS. 6 and 7 shown in Torm comprise such a construction that all of the filaments constituting the outermost sheath layer have the same diameter, the core is made of only a single filament rather than three filaments as stated in claim 2.

In view of the foregoing, the cited references fail to teach or suggest the claimed invention. Therefore, claim 2 is patentable.

Similar to claim 2, claim 9 adopts such a construction that a core constituting the core strand is made of three filaments and all of the filaments constituting the outermost sheath layer have the same diameter. None of the cited references teaches or suggests this structure.

Moreover, the importance of the relation of $0.55 \leq \phi / 6.14 \phi_s \leq 0.90$ recited in claim 9 is explained below.

The numeral “6.14” is a constant determined so that a ratio of ϕ with respect to ϕ_s becomes 1 when the core constituting the sheath strand is made of three filaments and all filaments constituting the sheath strand have the same diameter. And also, the constant “6.14” does not depend on the number of the filaments constituting each sheath layer if only the core is made of three filaments.

As this invention adopts such a construction that the diameter ϕ_s of the filaments constituting the outermost sheath layer is larger than that of the filaments constituting at least a layer located inside the outermost sheath layer, it is thought that a ratio of $\phi/6.14 \phi_s$ becomes smaller than 1.

To this end, claim 9 adopts $0.55 \leq \phi / 6.14 \phi_s \leq 0.90$ considering that the number of the filaments constituting the outermost sheath layer is within a range from 7 to 13.

In view of the foregoing, claim 9 is patentable.

AMENDMENT UNDER 37 C.F.R. § 1.111
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The remaining rejections are directed to the dependent claims. These claims are patentable for at least the same reasons as the independent claims, by virtue of their dependency therefrom.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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WASHINGTON OFFICE



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PATENT TRADEMARK OFFICE

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